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SCIENCE AND SPACE

See also Oregon Onna Column in Wash Post 10 April 69

Sky Spies: Nobody Has a Secret Anymore

Among the thousands of photographs processed recently in an unmarked building near Washington was one showing a Russian citizen walking along a Moscow street. It is one in a series: the first picture shows a wide-angle shot of all of Moscow; the second, shot through a second telephoto lens, reveals one Moscow street in considerable detail; the third photograph—of the man—is a photo enlargement of the street scene.

All in all, nothing extraordinary—except that the two cameras involved were inside a U.S. satellite orbiting more than 100 miles over Moscow.

This is the world of the milsat—the military-satellite program, where launches take place "in the black," away from the public eye. Even the size, cost and techniques of space reconnaissance cannot be pinned down. But such satellites, reports NEWSWEEK's Washington science correspondent Evert Clark, have harvested an embarrassment of information. After a good deal of digging, Clark himself harvested some facts on milsats:

Of the 458 U.S. satellite launchings since 1958, some two-thirds have had military assignments. Thousands of experts on photography, electronics, weaponry and economics are involved in the first rough processing of this satellite-collected information on any given day in the U.S. intelligence community. Much of their work is routine scanning of the pictures, radar signatures and coded radio messages that pour from the spy satellites. The most important data are winnowed out for the specialists.

The Defense Department space budget averages $2 billion a year, and the milsats generally are hidden within the budget category called "military astronautics." In addition, the budgets (undisclosed) of the CIA and other intelligence agencies probably include money for the interpretation of what the satellites return. So the milsat operation may be closer to $4 billion a year.

While it is not always possible to confirm who among U.S. industry does this work for the Pentagon, the names most frequently mentioned include Lockheed (maker of the rocket booster), CBS Laboratories, RCA, Itek, Hycon, Philco-Ford, TRW, General Electric and Aerojet-General. Firms such as Northrop and Avco build recovery gear (parachutes and nose cones) and Lockheed also apparently does a considerable amount of data processing.

Lyndon Johnson, for one, considered it all worthwhile. Thanks to recon satellites, he once said, "I know how many missiles the enemy has." There is no reason to believe his successor places less value on milsats. The U.S. not only can estimate how many SS-9 missiles the Russians have deployed and how advanced the Communist Chinese nuclear bomb project is but also how many millions of tons of rice China might expect to harvest this year and whether the wheat fields of central Russia will face drought this summer. The U.S. and the Soviet Union have gathered so much information from satellites about each other that some officials express the cautious hope that spy satellites might eventually bring about a détente between the two nations. Charles S. Sheldon II, chief of the Library of Congress Science Policy Research Division, regards milsats as one means to control the arms race and provide insurance against a nuclear war.

Significantly, last week at the disarmament conference in Geneva the U.S. gave some indication of the confidence it has in reconnaissance satellites when it abandoned its former demand that U.S. specialists be allowed into Russia to investigate suspected violations in the production of nuclear materials for weapons. Instead, the U.S. said it was willing to rely on the neutral members of the International Atomic Energy Agency to examine the plants. What the U.S. didn't say was that it was already monitoring the Soviet Union with, among other prying eyes, orbiting sensors that can detect an increase in the temperature of a river flowing downstream from a suspected nuclear production plant—a measure of activity inside the factory. And high among the reasons that the U.S. did not have to mention the capabilities of its snoopers is the simple fact that the Russians have firsthand evidence of how good their own spies-in-the-sky are.

SENTRIES IN SPACE
(1957-1969)

	Primarily CIVILIAN satellite launches	Primarily MILITARY satellite launches
U.S.	174	284
U.S.S.R.	170*	162*

*Estimated

Everything about milsats—U.S. or Russian—is supersecret. In the old days of the late '50s and early '60s, at least they had names such as Samos (for Satellite and Missile Observation System), Midas (for Missile Defense Alarm System) and Discoverer. Now even these have gone underground and are designated by numbers. Samos weighed 2,600 pounds; today's milsats may weigh 8,000 pounds and are often carried in an Agena D, an upper rocket stage that is 5 feet in diameter and 35 to 40 feet in length. With this increase in size there has been a sharp increase in what they can do. Some of the most important milsats:

- Early-warning satellite (number unknown). These milsats carry infra-red sensors and are usually launched into circular orbits 2,000 miles above the earth. They patrol space to spot the start of World War III, watching for Russian submarine-launched missiles, the Fractional Orbit Bombardment System (FOBS) weapons, as well as conventional Russian—and Chinese—ICBM's.
- 770, a side-looking radar satellite. It has a long, narrow antenna fitted along the length of the Agena so that the electronic beam looks to the right or left. This radar can "see" through heavy clouds and plot terrain with great detail.
- Ferret (number not known). These satellites engage in "Elint" or electronic intelligence; they are said to be capable of listening in—from 100 miles high—on ordinary telephone conversations, although this may be an exaggerated claim. Normally the Ferrets monitor routine Soviet Army and Air Force radio traffic, try to obtain the operating frequencies of Russian and Chinese radars, and "tickle" a ground-based transmitter into turning itself on and revealing its electronic characteristics.
- 823, once known as Vela. These are nuclear detection satellites with ultraviolet and X-ray sensors designed to pick up the radiation given off by a nuclear bomb test. Some range as far as 70,000 miles in space to detect any clandestine nuclear test "behind the moon."
- 920A, once known as Advanced Samos. These satellites carry special cameras, lenses and films that represent the best available optical technology today. Performance is measured by, among other standards, "ground resolved distance." If the GRD is 100 feet, shore lines and rivers can be identified. At a GRD of 10 feet roads can be identified. From about a 1-foot GRD—a capability credited to the U.S. by one expert for several years now—the make of a car may be identified.

"Reading the newspaper from space may be possible," says one specialist, "but you don't want that kind of information." He suggests that the U.S. uses "resolutions of about 6 to 18 feet—to see objects the size of a car, a tank, an airplane, the smallest missiles."

The milsats were sufficiently sharp-eyed last summer, at the time of the Russian invasion of Czechoslovakia, not only to spot a very long column of troops marching through Rumania, but also to identify the unit. But then the milsats

lost the troops—either because they entered a forest or, more likely, because heavy clouds covered the region.

Some satellite photography is shot on film sensitive to infra-red radiation; with such heat-sensitive sensors, U.S. milsats can keep track of factory production rates, darkened convoys rolling along a highway at night, jet aircraft flying through the air, ships entering or leaving port, or test firings of a new space booster from the Tyuratam Cosmodrome.

Weather: There are also milsats for geodetic readings of Russian or Chinese targets in the event of a nuclear war and for research into new materials and sensors. The program is so extensive that even the recon satellites have recon satellites—a fleet of secret weather ships that provides U.S. satellite-control centers with a picture of weather over the Soviet Union and mainland China; this information determines when new photographic milsats should be launched and when the cameras of milsats already in orbit should be turned on or off.

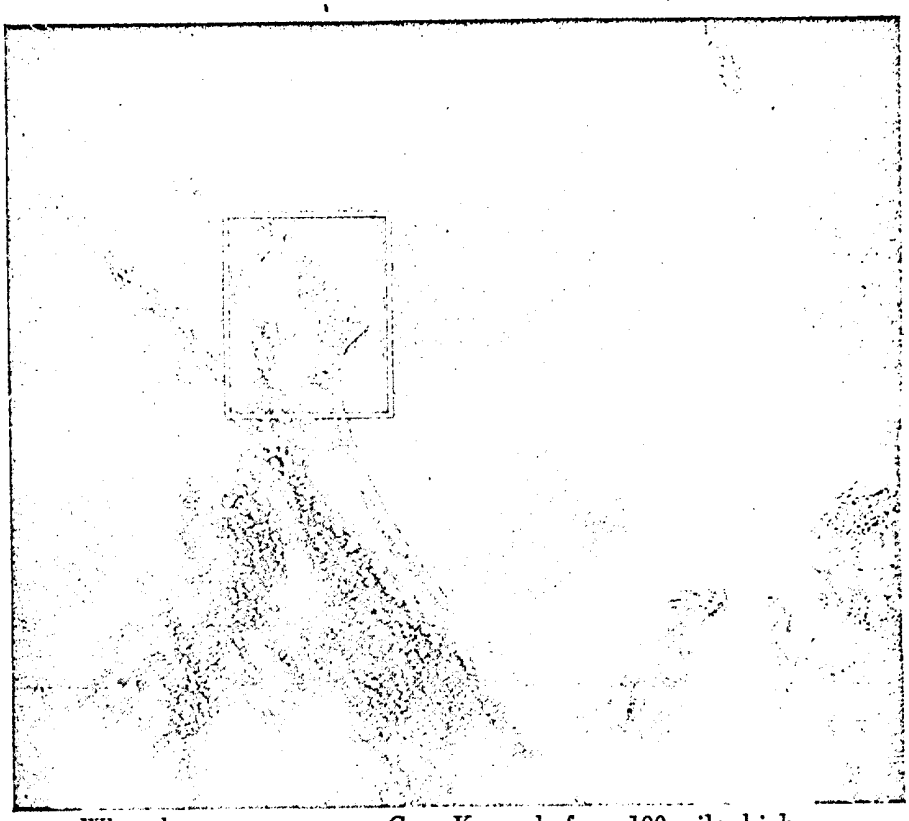
U.S. milsat launchings take place at Vandenberg Air Force Base, some 150 miles northwest of Los Angeles. Photographic satellites are not launched at random. To look for Soviet missiles, for example, calculations are made of possible trajectories between Russia and some likely target in the U.S. The trajectory is then "walked back" from the U.S. target to likely places of missile deployment in Russia—depending chiefly on the range credited to a given Russian missile. The boosters are Atlas-Agenas, Titan 3B-Agena-D's, or augmented Thor-Agenas. Polar orbits are often used so that nearly all of the earth passes beneath. Photographic milsats usually go into a low orbit, ranging from 90 to 175-250 miles. Ferrets usually enter a nearly circular orbit of about 300 miles.

U.S. milsats may orbit seven to 25 days. Some measurements are radioed to receiving stations believed to be in Guam, Hawaii, Alaska and New Hampshire, in addition to specially positioned aircraft and ships. One tracking facility may be at Pine Gap in Australia. It has been the target of considerable Russian propaganda broadcasts and has made some Aussies fear that they may become a potential target for Russian missiles.

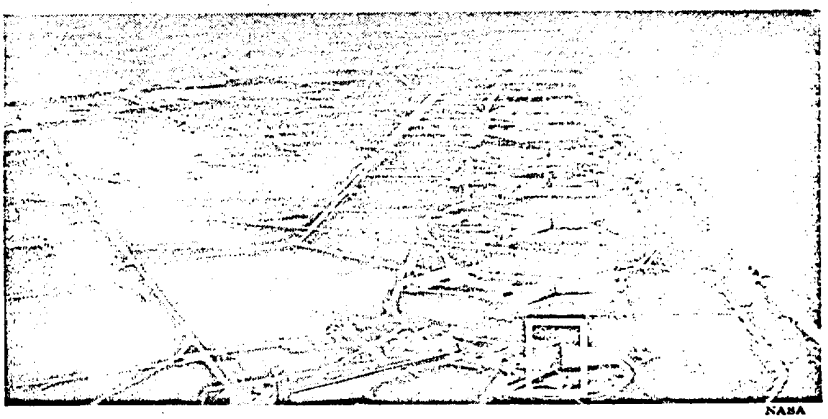
Air Drops: Space logs kept by the UN and others may show when a milsat reenters the atmosphere, but this can be deceptive; capsule "drops" can be made with the film re-entering in its own little spacecraft, complete with heat shield and landing parachute. The capsules are usually caught somewhere around 10,000 feet above the Pacific Ocean, near the Hawaiian Islands, by special Air Force cargo planes.

Russian spy satellites usually fly for eight days. Some are Vostok-sized (10,000 pounds) and come down on land intact, as in the Soviet pattern for manned flights.

Both nations are now developing super-spy satellites. Russian flights can now

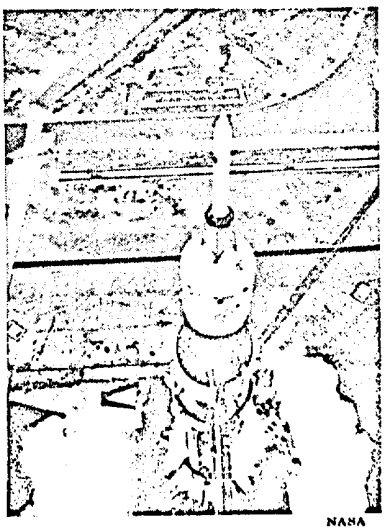


What the camera can see: Cape Kennedy from 100 miles high . . .



NASA

. . . Missile Row at the Cape with higher-resolution camera . . .



NASA

. . . a rocket launching close-up

continued

last up to fourteen days and perhaps will have weekly film-capsule "drops" from orbit. These spy satellites often attempt to track U.S. Polaris submarines beneath the oceans. And last August 6, the U.S. Air Force orbited the Integrated Satellite—the first milsat to carry several "snooper" systems all wrapped in one package including infra-red sensors, X-ray detectors and television cameras.

Asian Eye: IS was orbited with a perigee of 19,686 miles and an apogee of 24,769 miles, only slightly off the synchronous orbital altitude of 22,300 miles, where a satellite's orbital speed matches the earth's rotation. A synchronous satellite thus "hovers" above one area.

The Integrated Satellite's near-synchronous orbit in theory enables it to monitor North Vietnam, the southern half of China, and the middle of the Soviet Union. At perigee IS moves faster than the earth and so advances as far east as the South China Sea; at apogee, it travels slower than the earth and consequently slides as far west as the Indian subcontinent. To the north, IS passes almost directly above Saigon; to the south, it passes below Djakarta. In effect, it makes lazy figure-eights over the Asian land mass. More advanced models of the IS, ranging in weight from 1,200 to 8,000 pounds, are now in development.

With all the sky-spying going on, a lively field of satellite countermeasures has developed. Cloud cover, natural camouflage for a nation trying to avoid the scrutiny of reconnaissance satellites, is not always predictable. The Russians reportedly use helicopters to carry men and supplies into missile sites so that such incriminating evidence as roads may be erased. And Communist China may have built five dummy test installations in the Sinkiang Desert, near its Lop Nor nuclear testing grounds, to confuse U.S. orbiting spies. While such tactics might fool satellites carrying only cameras, they probably would not deceive all of the varied sensors on an Integrated Satellite.

Rice: Once missile silos are plotted and the bomber and sub bases surveyed, the milsat can be assigned to other tasks. In the U.S. intelligence community there has sprung up a new specialty called "econ recon," or economic reconnaissance. Rice, for example, not only gives off infra-red radiation that is distinctly different from that of wheat, but healthy rice has a radiation characteristic different from diseased rice. Specially calibrated infra-red sensors aboard econ-recon satellites can survey Red China's crops to determine if the harvest that year will be bumper or poor.

Econ-recon satellites could also lead a technologically advanced nation to undiscovered oil and mineral resources in underdeveloped countries. But technology may bring spy satellites within reach of everyone. A Rand Corporation study made for the U.S. Air Force suggests that small nations (such as Israel) might have cameras in space snooping away at their neighbors.